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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/544,344

04/06/2000

Arthur W. Snow

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EXAMINER

SODERQUIST, ARLEN

ART UNIT

PAPER NUMBER

1743

DATE MAILED: 04/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/544,344

Applicant(s)

SNOW ET AL.

Examiner

Arlen Soderquist

Art Unit

1743

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 February 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-9,21,22,25-38 and 40-55 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-9,21,22,25-38 and 40-55 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 April 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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1. Since it is relevant to the interpretation of the claims, examiner defines "coupling agent" as found in the instant specification on page 17, line 22 to page 18, line 20 which is reproduced below with added emphasis.

"The sensor surface and substrate are cleaned by a plasma or chemical treatment and coupling agents are applied. Coupling agents are difunctional molecules with an inert spacing structure separating the functional groups (e.g. an α - ω silyl alkanethiol, such as $(\text{CH}_3\text{O})_3\text{Si}(\text{CH}_2)_3\text{SH}$, or a dithiol, $\text{HS}(\text{CH}_2)_6\text{SH}$). One functional group bonds to the sensor/substrate (e.g., the $-\text{Si}(\text{OCH}_3)_3$ or the $-\text{SH}$ functional group) surface, and the other (e.g., a second $-\text{SH}$ functional group) is oriented away from the surface for subsequent bonding with the multiplicity of particles. The ligand shell of the metal particle is a dynamic system where an individual molecule may be displaced by a similarly functionalized molecule. Thus, the immobilized thiol group of the absorbed coupling agent may bond to a particle and immobilize it on the aforementioned surface. In this fashion a monolayer of particles is chemisorbed on the surface. Subsequently, the immobilized particle monolayer is exposed to a solution of a dithiol coupling agent. The dithiol exchanges with some of the monofunctional thiol ligand molecules in the immobilized particle ligand shell and positions the second thiol group on the outer surface of the immobilized particle's ligand shell. A second exposure to a solution for forming the stabilized multiplicity of particles results in chemisorption of a second particle layer on the first. In this manner many layers of particles are built up into a multilayer film."

From this language in the instant specification, it is clear that when language in the claims excludes coupling agents from the ligand molecules in the encapsulating layer, the three-dimensional structure excludes molecules in the ligand shell that would couple or immobilize the particles to or on a surface or other particles. Additionally, under this definition, exclusion of coupling agents from the encapsulating ligand shell molecules of the encapsulating layer excludes heterofunctionality in the ligand shell molecules capable of binding and/or immobilizing the particles to another particle or surface/substrate within the scope of the particle core and substrate materials of the claim(s).

2. Claims 5 and 46 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 1 limits the tail structure to a group that does not include a primary aliphatic moiety (group) as the functional group. Thus these claims are

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outside of the scope of claim 1. Due to the presence of these claims, claim 1 will be treated with art that would include the presence of primary alkanes in the encapsulating ligand shell.

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-2, 4-9, 25-32, 37-38, 40-48 and 50-55 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Each of independent claims 1, 25 and 27 contain a subparagraph defining the tail as having a tail functional group wherein the tail functional group is selected from a Markush group including a heterofunctional group, an aromatic group, a secondary aliphatic group, an araliphatic group and a tertiary aliphatic group. It is the tail having a functional group that includes these items that is not consistent with the disclosure. The paragraph starting at page 12, line 6 is the only place that the ligand molecule is characterized as having a head-tail structure with a functional group for bonding with the metal atoms as the head and the tail having a structure and composition designed to provide additional stabilization of metal clusters (i.e., core bodies) against irreversible agglomeration, induce solubility in solvents and promote interactions with chemical species of interest (lines 13-19). Lines 21-23 teach a functionalized organic molecule as a preferred type of molecule. Since the head is a functional group (thiol or amine), the tail or organic part is not required to be a functional group. In the list that follows there is a clear distinction between molecules having only a hydrocarbon or organic structure and those that have a second heterofunctional group substituted on the organic part. This distinction is also seen the above section of the specification defining coupling agents as "difunctional molecules with an inert spacing structure separating the functional groups". In this definition the organic or hydrocarbon portion is characterized as "an inert spacing structure" that separates the functional groups. This distinction is also found in the paragraph starting on page 25, line 4 of the instant specification. In this paragraph sensitivity of the particles is taught as being chemically modulated by introduction of a heterofunctionality to the ligand shell. The

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heterofunctionality is a heteroatom functional group making the ligand molecule bifunctional rather than monofunctional. Of the two functional groups one group binds with the metal core surface and the other group provides an attractive interaction for sorption of target species. Here again the organic or hydrocarbon portion of the molecule is not treated as a functional group. Thus it is the tail portion of the ligand molecule that is properly claimed as the Markush group rather than only a portion of the tail.

5. Claims 1-2, 4-9, 21-22, 25-27, 29-38 and 40-55 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a device having the multiplicity of core/ligand shell particles in three-dimensional close-packed orientation made by the process of claim 28 when the ligand shell is composed of an encapsulating monomolecular layer of ligand shell molecules that are not coupling agents, does not reasonably provide enablement for a three dimensional structure made by a process other than the spraying process of claim 28. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. The above noted definition of a coupling agent appears to exclude the layer by layer method and the three dimensional structures produced thereby. Page 17, lines 9-11 teach that a method of casting from solution followed by slow evaporation does not produce an acceptable film. See page 17, line 8 through page 19, line 2 of the instant specification for the only methods for forming the multiplicity of particles in three-dimensional close-packed orientation that are taught in the specification. Applicant and the art of record do not teach any other manner of making the particles in three-dimensional close-packed orientation. Thus, the three methods taught in the instant specification, only the spraying method appears to be within the scope of the ligand shell being composed of an encapsulating monomolecular layer of ligand shell molecules that exclude coupling agents as in the instant claims.

6. Claims 1-2, 4-9, 21-22, 25-38 and 40-51 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Each of the independent claims contains the following phrase "the tail having a structure and composition designed to provide additional stabilization of metal clusters against irreversible agglomeration" in the language describing the properties of the ligand shell. Page 8, lines 11-13 teach that a particle is typically "stabilized" by

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the metal core being effectively encapsulated by the ligand shell. Page 14, line 18 to page 15, line 1 teach that it is important for the ligand to have a strong interaction with the neutral metal core to prevent the metal core from coagulating and being able to be redispersed. In this section thiol compounds and amines are specifically exemplified as providing this strong interaction. Also in the above definition of a coupling agent, it appears that any bifunctional molecule in which both functional groups cause the particles to be bound to a surface or particle are excluded since they would cause irreversible agglomeration. In this respect examiner points out the previously cited Colvin reference (Journal of the American Chemical Society 1992) which clearly shows that a bifunctional molecule having thiol and carboxylate groups as the two functional groups that can be used to bind particles to an aluminum surface/substrate. Thus it is not clear if the above language regarding the tail structure prevents a bifunctional molecule such as the claimed heterofunctional group from having the carboxyl functionality. There is a particular question as to the allowed scope of the tail (functional group/structure) in claims 37, 40 and 50 in that they specifically recite the carboxyl acid group, that the Colvin reference teaches as having a strong interaction with an aluminum surface (promotes agglomeration).

7. No art rejection is set forth in this office action due to the definition of a coupling agent as set forth above and its exclusion from the ligand shell molecules that make up the ligand shell in the language of all of the independent claims.

8. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. The previously presented art rejection will be reconsidered should a structure allowing coupling agents in the ligand shell be claimed again.

9. The declaration filed on February 16, 2006 under 37 CFR 1.131 has been considered but is ineffective to overcome the Nakanishi reference. First, the declaration does not identify the instant application as the application for which it was prepared. Second, the evidence submitted is insufficient to establish a reduction to practice of the invention in this country or a NAFTA or WTO member country prior to the effective date of the Nakanishi reference. Applicant is required to show that they were in possession of the portion of the claimed invention taught by the reference. In this case it is the layer by layer formation of the three-dimensional structure that was taught by Nakanishi. In reviewing the declaration, examiner was not able to find a disclosure of this in the documents provided. The first mention of this is in the provisional

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application that the parent application claim basis on. Thus the first evidence of the layer-by-layer method of constructing the three-dimensional structure is the filing date of the provisional application, which is after the date of the Nakanishi reference. Examiner notes that an earlier paper of Nakanishi showing the layer by layer method is cited with this action.


10. Claims 28, 35-36 and 42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. The art of record fails to teach or suggest the claimed combination or elements. Relative to claims 35-36, it is noted that although the respective elements are conventional as evidenced by the page 21, line 17 to page 22, line 8, examiner was not able to determine if they are part of the measurement apparatus taught by Terrill.

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additionally cited art relates to formation of metal clusters or particles.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose telephone number is (571) 272-1265. The examiner's schedule is variable between the hours of about 6:30 AM to about 5:00 PM on Monday through Thursday and alternate Fridays.

A general phone number for the organization to which this application is assigned is (571) 272-1700. The fax phone number to file official papers for this application or proceeding is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Arlen Soderquist
Primary Examiner